PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION See Form PCT/IPEA/416	
E35253 JFL/J		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/NO2004/000167	10.06.2004	01.07.2003
International Patent Classification (IPC) or national classification and IPC		
B65G 47/76 , B65G 47/84 // B07C 3/06		
Applicant		
Tomra Systems ASA et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 6 sheets, as follows:
      - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
28.01.2005	18.07.2005
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Form PCT/IPEA/409 (cover sheet) (April 2005)

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/NO2004/000167

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☐ the international application in the language in which it was filed

☐ a translation of the international application into _____ ,
which is the language of a translation furnished for the purposes of:

☐ international search (Rules 12.3(a) and 23.1(b))

☐ publication of the international application (Rule 12.4(a))

☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☐ the international application as originally filed/furnished

☒ the description:

pages 2-9 as originally filed/furnished

pages* 1 received by this Authority on 28.01.2005

pages* _____ received by this Authority on _____

☒ the claims:

pages _____ as originally filed/furnished

pages* _____ as amended (together with any statement) under Article 19

pages* 10-14 received by this Authority on 28.01.2005

pages* _____ received by this Authority on _____

☒ the drawings:

pages 1-11 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
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Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-27	YES
	Claims		NO
Inventive step (IS)	Claims	1-27	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-27	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The invention relates to a device for directionally guiding articles of different shapes that are being conveyed on a conveyor, off the conveyor using a movable gate that is controllable to turn across the conveyor to an angle relative to the direction of movement of the conveyor. Often, the articles are slowed unduly by such gates, especially if the gate forms a large angle with the direction of travel of the conveyor. According to the invention, the gate has at least one rotary motor-driven fully circular disc that causes the article to be forcibly driven through aid of disc rotation along the gate, in a direction corresponding to said angle, off the conveyor and to an exit.

Reference is made to the following documents:

D1:DE 2728936 A1
D2:US 4564105 A

D1 shows a device for directionally guiding articles that are conveyed on a conveyor off the conveyor with the aid of a gate. The gate comprises one or two rotary disc-like means that may, in some rotational positions, let an article pass freely between the sectors or segments, and in other rotational positions guide an article off the conveyor. The gate is fixed in that it cannot turn from one position relative to the direction of the conveyor, e.g. alongside the conveyor, to a position forming an angle with the direction of the conveyor, and thus it can direct an article off the conveyor to one location only.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Box V

Further, D2 shows a device for directionally guiding articles that are conveyed on a conveyor off the conveyor with the aid of a movable gate that is controllable to move across the conveyor at an angle to the direction of travel of the article on the conveyor. The gate consists of a motor-driven spiral shaped sweep disc rotated to cause it to engage a selected article on the conveyor. The spiral shape then rapidly accelerates the lateral or sideways movement of the article to push it off the conveyor as the article is forcibly driven along the gate. The spiral shaped sweep disc has a non-vertical, non-horizontal axis of rotation. The cycling of the spiral shaped sweep disc can be controlled in a number of ways. For example, each article could have a code applied to it which is read as the article passes a reader upstream of the sweep. If the reader finds a code to which the reader is supposed to respond, it transmits this information to the sweep's drive. The speed is set depending on, for example, a combination of the size of the article and the speed of the main conveyor.

The invention claimed in the amended claims differs from the above prior art in that it has at least one rotary motor-driven fully circular disc arranged controllable to turn across the conveyor to an angle relative to the direction of movement of the conveyor, thus causing the article to be forcibly driven through aid of disc rotation along the gate, in a direction corresponding to the said angle, off the conveyor and to an exit.

The invention defined in the amended claims 1-27 is not disclosed by any of these documents.
The cited prior art does not give any indication that would lead a person skilled in the art to the claimed device. Therefore, the claimed invention is not obvious to a person skilled in the art.
Accordingly, the invention defined in claims 1-27 is novel and is considered to involve an inventive step. The invention is industrially applicable.

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The Swedish Patent Office
PCT International Application

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SORTER DEVICE

The present invention relates to a device for directionally guiding articles of different shapes that are being conveyed on a conveyor off the conveyor with the aid of a movable gate that is controllable to turn across the conveyor to an angle to direction of movement of the conveyor.

Such devices are well known in many contexts, but often have the common characteristic that the articles are slowed unduly by the gate, especially if the gate forms a large angle with the direction of travel of the conveyor.

Therefore, there has long been a need to be able, in an effective and simple manner, to remove articles from a conveyor using a movable gate so as to ensure an efficient removal.

According to the invention, the device is therefore characterised in that the gate has at least one rotary motor-driven fully circular disc which is configured to cause the article to be forcibly driven through aid of disc rotation along the gate, in a direction corresponding to said angle, off the conveyor and to an exit.

Other embodiments of the device will be apparent from the attached subsidiary claims and from the following description with reference to the attached drawings.

In the following drawings, the phrase "sorting to the left" means that the device causes sorting to the left-hand side seen in relation to the direction of travel of the conveyor. Similarly, the phrase "sorting to the right" will be related to the direction of travel of the conveyor.

In the attached drawings, the different embodiments of the device are shown as typical exemplary embodiments which could be modified without thereby deviating from the inventive idea.

Figure 1 shows a device for sorting to the left, with the gate at a first angle relative to the direction of travel of the conveyor.

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Patent claims

1.
A device for directionally guiding articles of different shapes that are being conveyed on a conveyor off the conveyor with the aid of a movable gate that is controllable to turn across the conveyor to an angle relative to direction of movement of the conveyor,
characterised in
- that the gate has at least one rotary motor-driven fully circular disc which is configured to cause the article to be forcibly driven through aid of disc rotation along the gate, in a direction corresponding to the said angle, off the conveyor and to an exit.

2.
A device according to claim 1,
characterised in
- that the gate has two motor-driven, rotary and parallel discs rotating in the same rotational direction, wherein the two discs are spaced by a distance that is greater than the largest cross-section of an article to be guided.

3.
A device according to claim 2,
characterised in
- that the gate has a central position in which the two discs are parallel to the longitudinal direction of the conveyor to allow articles to pass unobstructed therebetween.

4.
A device according to claim 2 or 3,
characterised in
- that the two discs are driven by a common drive motor via a common drive shaft, and that the two discs are are arranged to be turned into said angle relative to a common pivot point located centrally above the conveyor.

5.
A device according to claim 1, 2, 3 or 4,
characterised in
- that said at least one circular disc has a non-vertical axis of rotation.

6.
A device according to claim 1, 2, 3, 4 or 5,

characterised in

- that said at least one circular disc has a horizontal axis of rotation.

7.

A device according to claim 1, 2, 3 or 4,
characterised in

- that said at least one circular disc has a non-horizontal axis of rotation.

8.

A device according to one or more of claims 1 - 7,
characterised in

- that said gate is controllable to assume at least three angularly different positions relative to the movement direction of the conveyor.

9.

A device according to one or more of claims 1 - 8,
characterised in

- that said gate is arranged to assume at least five angularly different positions relative to the movement direction of conveyor.

10.

A device according to one or more of the preceding claims,
characterised in

- that said at least one circular disc has a speed of rotation which yields a surface speed at a radial location on the disc where the disc makes contact with the article, said speed being a function of the angle which the gate turned relative to the direction of movement of the conveyor.

11.

A device according to one or more of claims 1 - 10,
characterised in

- that said at least one circular disc has a speed of rotation which yields a surface speed at a radial location on the disc where the disc makes contact with the article, said speed being a function of the weight, size and/or shape of the article.

12.

A device according to claim 10 or 11,
characterised in

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- that the speed of rotation of the circular disc is a function of the movement speed of the conveyor.

13.
A device according to claim 12,
characterised in
- that the speed of rotation of the circular disc is equal to or greater than the movement speed of the conveyor.

14.
A device according to one or more of claims 1 - 13,
characterised in
- that said at least one rotary and circular disc is designed to cause the article to be given an accelerated movement off the conveyor.

15.
A device according to any one of the preceding claims,
characterised in
- that said at least one rotary and circular disc has a frictional surface.

16.
A device according to claim 9 or 10,
characterised in
- that the gate is cooperative with a flag device for detecting the angular position of the gate relative to the direction of movement of the conveyor.

17.
A device according to claim 16,
characterised in
- that the flag device is optical, electromagnetic, capacitive or electromechanical.

18.
A device according to one or more of the preceding claims,
characterised in
- that the gate is designed, upon turning into a desired angular position, to cause, at the same time, movement of an auxiliary gate cooperative with the gate and positioned essentially parallel to the gate at a distance therefrom adapted to be able to pass the article through a space therebetween.

19.
A device according to one or more of the preceding claims,
characterised in
- that a detector device for identifying or detecting any characteristic features or parameters of the article is located upstream of the gate and adjacent the conveyor.

20.
A device according to claim 19,
characterised in
- that the device is, on the basis of said identified or detected features or parameters, designed to control the gate to assume a desired angular position relative to the conveyor.

21.
A device according to claim 18 or 19,
characterised in
- that device is, on the basis of said identified or detected features or parameters, designed to control the speed of rotation of the at least one disc relative to the movement speed of the conveyor and/ or the angular position of the gate relative to the conveyor.

22.
A device according to one or more of claims 1 - 21,
characterised in
- that the gate is designed to guide articles to said exit, wherein said exit is, with the aid of the controllable gate, selectable from among at least a first and a second exit.

23.
A device according to claim 22,
characterised in
- that at least one of said first and second exits is associated with an post-treatment unit for the article with subsequent storage container or conveyor.

24.
A device according to claim 23,
characterised in
- that said exit cooperates with a storage container.

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25.
A device according to claim 23,
characterised in
- that the post-treatment unit is a compactor or a disintegrator.

26.
A device according to claim 23 or 25,
characterised in
- that the post-treatment unit for said first and said second exits respectively are constructed differently, but are driven by a common drive unit.

27.
A device according to one or more of claims 1 - 26,
characterised in
- that gate is designed for sorting articles in the form of empties, for example, bottles or cans.